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(19)(CA) **APPLICATION FOR CANADIAN PATENT** (12)

(54) Device for Projecting a Dose of Divisible Substance

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A B S T R A C T

A device for projecting a dose of divided substance in liquid or powder form, in particular for pharmaceutical use comprises a receptacle having an outlet orifice, a tearable partition separating the receptacle into two chambers, namely a first chamber adjacent to the outlet orifice and serving to receive the divided substance, and a second chamber which includes a compressed gas at the moment of use, means being provided for perforating the partition at the moment of use.

A DEVICE FOR PROJECTING A DOSE OF A DIVISIBLE SUBSTANCE

The present invention relates to a device for projecting a dose of a divisible substance, in liquid or powder form, for medical purposes.

BACKGROUND OF THE INVENTION

There is often a need to apply a medicine in powder or liquid form inside the throat or the nostrils. This operation is difficult, particularly with the nostrils, since it is necessary to lean the head backwards. In spite of the precautions taken, some of the medicine may miss the target. The expected effect cannot be obtained in full, and dosage is random. An object of the present invention is to provide a device for expelling a medicine in finely divided form. The medicine can thus be directed into the throat or the nostril without loss, thereby obtaining maximum effectiveness.

SUMMARY OF THE INVENTION

According to the present invention, this result is obtained by a device for projecting a dose of a divisible substance in liquid or powder form, in particular for pharmaceutical applications, the device comprising a receptacle having an outlet orifice, a tearable partition separating the receptacle into two chambers, namely a first chamber adjacent to the outlet orifice for receiving the divisible substance and a second chamber which, at the moment of use, contains a compressed gas, and means for perforating the partition at the moment of use.

The means for perforating the partition may be a pin, preferably a grooved pin, fixed to a deformable wall. By pressing against the deformable wall, the pin is displaced and perforates the partition. By reducing the volume of the second chamber, deformation of the wall either increases or establishes gas pressure inside the second volume, with the gas thus being compressed at the moment the device is used. Wall deformation may be obtained by the wall being flexible, or else the wall may include a cylindrical portion having a slidable piston therein. It is advantageous to increase pressure before perforating the partition.

Advantageously, the receptacle is made in a single piece. The receptacle may be made of glass or of plastic.

Advantageously, the second chamber may be filled with nitrogen at a pressure not less than atmospheric pressure. The first chamber may also be filled with nitrogen in addition to the substance to be dispensed.

In a particular embodiment of the invention, the receptacle comprises:

a piston having an axial hole passing therethrough, a peripheral groove, and a peripheral sealing lip;

an endpiece including the outlet orifice and resilient means capable of snap-fastening in the groove of the piston, the endpiece and the piston defining a housing capable of receiving a cartridge, the cartridge comprising a side wall and the tearable partition, and representing the enclosure of said first chamber containing the substance to be projected, there being a contact surface between the piston and the cartridge, said contact surface providing an airtight seal; and

wherein the deformable wall is a hollow cylinder provided with an end wall and a cylindrical side wall inside which the piston slides so that the sealing lip is in contact with said side wall over its entire periphery, the grooved pin being disposed on the end wall of the cylinder in such a manner as to be capable of passing through the hole and piercing the tearable partition.

Advantageously, a spring may urge the cylinder away from the piston.

Peripheral beading optionally may be formed on an inside surface of the cylinder so that when the device is assembled, the piston can be inserted inside the cylinder by forcing the sealing lip to pass over the beading, with the urging from the spring plus the traction force required for undoing the snap-fastening of the resilient means of the endpiece being insufficient for moving the sealing lip back over the beading.

In another particular embodiment of the invention including a piston sliding in a cylinder, a first end of a cartridge delimiting the first chamber is received in sealed

manner as a push fit in one end of the cylinder, said first end of the cartridge being formed by the tearable partition, and in that an endpiece including the outlet orifice being engaged as a push fit over a second end of the cartridge.

Advantageously, a spring urges the piston away from the cartridge.

The cartridge of the two particular embodiments described above may be made of glass or of plastic.

The tearable partition may be a heat sealed film. It may be made of a heat conducting material. It may occupy the entire cross-section of the first chamber so as to transmit a maximum amount of heat.

In a particular embodiment of the invention, the first chamber includes a cylindrical cup containing a powder to be projected and constituted by an end wall and a peripheral side wall extending vertically from said end wall, said peripheral side wall including sealing means at its top end engaged as a force fit in said first chamber, said peripheral side wall also including at least one non-radial orifice passing therethrough directed inwards and towards the end wall of the cup, said end wall of the cup including a convex conical surface inside the cup, the cup co-operating with said first chamber so as to enable the compressed gas to pass from the inside of said first chamber into the cup via the orifice(s) without ejecting the cup, with the orifice(s) co-operating with said conical surface when the compressed gas passes therethrough to create turbulence while simultaneously expelling the substance to be projected.

Advantageously, the first chamber containing the substance to be dispensed is constant in section, and the outlet orifice has the same section as said first chamber.

The device may be provided with a plug including a lid with a skirt projecting therefrom to a bottom end of the skirt, said skirt engaging as a sealed force fit in the first chamber, the device being characterized in that the skirt includes a slot extending up a portion of its height from its bottom end. A tear-off metal capsule may be crimped over the plug.

BRIEF DESCRIPTION OF THE DRAWINGS

Embodiments of the invention are described by way of example with reference to the accompanying drawings, in which:

Figure 1 is a section through an embodiment of the invention for projecting a powder;

Figure 2 is a similar view of an embodiment for projecting a liquid;

Figure 3 is a view analogous to Figure 1 showing a variant embodiment;

Figure 4 is a section view through a particular embodiment of the invention;

Figure 4a is a section through the piston of the device shown in Figure 4;

Figure 5 is a section view through the cartridge of the device shown in Figure 4, packaged for storage purposes;

Figure 6 is a section view through an embodiment of the invention analogous to that of Figure 4, with the piston and the pushbutton being omitted;

Figure 7 is a section through the cartridge of the Figure 6 device, packaged for storage purposes; and

Figure 8 is a section view through another embodiment of the invention.

DETAILED DESCRIPTION

The embodiment shown in Figure 1 is a small device comprising a body 1 separated in two chambers 1A and 1B by a tearable partition 2. The small-volume first chamber 1A is adjacent to the outlet orifice 3 which, prior to use, is normally closed by a plug 4. This chamber is intended to receive a powder which may occupy all or part of the volume of the chamber. The second chamber 1B is cylindrical and contains a piston 5 provided with a grooved pin 6 disposed so as to pierce the partition 2 during displacement of the piston towards the first chamber. The piston is controlled by a push-button 7 and a drive rod 8. The piston may be held inside the cylinder by peripheral beading 9. The body 1 may be molded with a tear-off guarantee strip 11 for guaranteeing that it has not been tampered with. The second chamber 1B may be filled

initially with gas at some pressure higher than atmospheric in order to increase the projection effect.

Advantageously, the chamber 1B may be filled with nitrogen at a pressure not less than atmospheric in order to guarantee the purity and the aseptic state of the gas contained in said chamber 1B. The chamber 1A may also be filled with nitrogen in addition to the substance to be projected. The tear-off strip 11 may be integrally molded with the pushbutton 7, thereby making it possible for the body 1 to be made of glass instead of plastic.

This device operates as follows.

After the strip 11 has been torn off, the user removes the plug 4 and places the device in position for the desired application (e.g. by engaging the leading end of the first chamber 1A in a nostril). Thereafter, the pushbutton 7 is depressed over its entire stroke H which corresponds substantially to the width of the guarantee strip.

After moving a distance h, the pin 6 perforates the partition 2, which then tears. The air (or other gas) compressed by the piston 5, plus any initial pressurization, is released and passes quickly through the first chamber 1A towards the outlet 3, thereby entraining the powder which is projected outwards. The hole made in the partition 2 generates a venturi effect, which enhances the entrainment of the powder by the air. After use, the device is discarded. Its extremely simple structure makes it suitable for application in the medical field.

It will be understood that the chamber 1A should be smaller than the gas chamber 1B in order to ensure that the powder is thoroughly swept out. The first chamber 1A is advantageously in the form of a tube without constriction so as to enhance powder entrainment, but it need not necessarily be cylindrical. The body 1 has a flange close to the pushbutton 7 for facilitating handling of the device and for holding it during application. The pin 6 may have longitudinal ribs or grooves for facilitating tearing of the partition 2 and for guaranteeing that air passes through it in the event of said partition merely being perforated without tearing.

The device shown in Figure 2 differs from that of Figure 1 only in that it includes a spray nozzle for a liquid. In this example, the nozzle is constituted by a bushing 15 which may be welded or glued to the wall of the body 1, and a core is placed inside the chamber to co-operate with an outlet hole 17 through the bushing 15. The chamber 1A is thus initially filled with liquid, possibly together with some gas.

In a variant application, it is possible to use a wad 18, constituting an intermediate piston which is pushed by the air once the partition 2 has been pierced by the pin 6 on the piston 5, with the wad then pushing the liquid towards the nozzle. This makes it possible to use the device in any position.

In one method of using the Figure 2 embodiment of the invention, the second chamber 1B may contain both liquid and gas. By holding the device with its outlet down and with its piston up, when the pin 6 pierces the partition, the compressed air will expel the liquid from the second chamber 1B into the first chamber 1A, the liquids will mix, and the mixture thus prepared at the moment of use is expelled by the air pressure through the nozzle. It is thus possible to project a dose constituted by two substances which are mixed together at the last moment only, immediately prior to use, and in fact substantially simultaneously with use. In a variant, the pin 6 may be close to the partition 2 and the gas in the second chamber 1B is not initially under pressure. Thus, a small displacement of the pushbutton pierces the partition, thus making it possible to shake the device in order to mix two liquids prior to pressing the pushbutton home in order to project the mixture.

Figure 3 shows a variant in which the deformable wall is constituted by a substantially hemispherical wall 21 made of flexible material, analogous to a spray bulb. By pressing on the pushbutton 7, the wide end of the rod 8 bears against the bulb. Squeezing the bulb causes pressure to rise prior to the pin 6 perforating the partition 2.

The periphery 21A of the flexible wall 21 may be glued or welded to the receptacle body 1. This wall may be integrally molded with the pin 6. This ensures high quality sealing for the gas or air etc. that may be enclosed inside the chamber 1B over a long period of time without significant loss. The pushbutton 7 and its rod 8 may also be integrally molded with the wall 21 and the pin 6, or they may be overmolded onto said wall.

Figures 4, 4a, and 5 show an embodiment of the invention in which the projection device is reloadable, and is more particularly intended for spraying lyophilizates. This device comprises:

A pushbutton 30 comprising a cylindrical bottom 31, itself including an inside face, an outside face, and an outside periphery, said pushbutton 30 also including a cylindrical side wall 32 extending upwards from said outside periphery, said cylindrical side wall 32 itself including a substantially cylindrical inside surface, a cylindrical outside surface, and a top end. A cylindrical shoulder 33 is formed on the inside face of the bottom 31, substantially centered on said inside face. A grooved pin 6 is provided on the shoulder 33. The inside surface of the cylindrical side wall 32 has peripheral beading 9 near the top thereof.

A generally cylindrical piston 40 suitable for sliding vertically inside said cylindrical side wall 32 and comprising a top face, a bottom face, and a substantially cylindrical peripheral surface 44. A cylindrical hole 41 substantially coaxial with the piston 40 passes through said piston from top to bottom and is of a size to allow the grooved pin 6 to pass therethrough when the piston slides downwards. A cylindrical housing 42 is formed in the top face of the piston, substantially coaxially with the cylindrical hole 41, and extending downwards from the said top face to a plane annular surface 46. A peripheral groove 43 is formed in the top portion of the cylindrical peripheral surface 44. Said peripheral surface 44 is extended downwards and outwards by a peripheral sealing lip 45 bearing against the inside surface of

the cylindrical side wall 32. The sealing lip 45 is such that the piston 40 can be inserted inside the pushbutton 30 by forcing the sealing lip 45 to pass over the peripheral beading 9 during assembly of the device and without damaging said sealing lip 45.

A substantially helical spring 34 is placed inside the pushbutton 30, being engaged on and retained by the cylindrical shoulder 33 and being adapted to push the piston 40 upwards. The stiffness of the spring 34 is such as to enable it to be compressed by finger force applied by a user, and it is not capable of forcing the sealing lip 45 of the piston 40 to pass back over the peripheral beading 9 of the pushbutton 30.

A cylindrical cartridge 50 having a cylindrical side wall is made of glass or of plastic, and comprises a top face, a plane bottom end face 52, a cylindrical outside surface, and a cylindrical inside surface. The cartridge 50 also includes a tearable partition 2 advantageously constituted by a film heat-sealed to the plane bottom end face 52 of the cylindrical side wall 51. The cartridge 50 is inserted inside the cylindrical housing 42. The inside of the cartridge 50 constitutes the chamber 1A, which the chamber 1B is delimited by the pushbutton 30, the piston 40 associated with the pushbutton 30 via the sealing lip 45, and the tearable partition 2 which comes into contact with the annular horizontal face 46.

An axially symmetrical endpiece 60 is placed over the above-described set of components and includes an orifice 3, a cylindrical inside housing 61 in which the cartridge 50 is received, at least three arms 62 extending downwards and provided with respective lugs 63 at their bottom ends for snap-fastening in the peripheral groove 43 of the piston 40 with the force required for snap-fastening being small enough to avoid significantly compressing the spring 34 and with the traction force required for undoing the snap-fastening being small enough to avoid causing the sealing lip 45 of the piston to pass back over the peripheral beading 9, said endpiece 60 also including a cylindrical peripheral sleeve 64 extending downwards and extended by a flange 65 projecting radially outwards and intended to facilitate handling by a user.

The piston 40, the cartridge 50, and the endpiece 60 are shaped and sized in such a manner that when the arms 62 are snap-fastened in the peripheral groove 43, the bottom end face 52 of the cylindrical side wall 51 and the film heat-sealed to the end face 52 are pressed against the annular horizontal surface 46 of the piston 40 so as to provide sealing. The chamber 1B is thus sealed.

When a user seeks to project a dose of substance, the user takes a cartridge 50 as shown in Figure 5, i.e. including a plug 4 and a tear-off metal capsule 99 provided for storage purposes. The user then removes the capsule 99 and the plug 4, places the cartridge 50 in the housing 52 of the piston 40, and then covers the assembly with the endpiece 60, ensuring that the lugs 63 on the arms 62 snap into the peripheral groove 43 of the piston 40. The device is then ready for use. Projection is performed by holding the endpiece 60 between the index and middle fingers and pressing against the pushbutton 30 with the thumb. The thrust initially compresses the air inside the second chamber 1B, then the grooved pin 60 pierces the tearable partition 2. The compressed air inside the second chamber 1B then rushes into the first chamber 1A and projects out the lyophilizate contained in the first chamber 1A. Before projection, the lyophilizate is in the form of an agglomerate. It is broken up into powder form by the violence of the rush of compressed air. As a result, it is essential that the cartridge 50 does not have any constriction and that the orifice 3 is at least as wide as the inside of the cartridge 50 so as to avoid clogging the orifice with lyophilizate, which would cause the substance to be projected badly or not at all.

After projection, the spring 34 returns the piston to its initial position, the endpiece 60 is removed from the assembly merely by pulling, and the empty cartridge 50 is thrown away. The other components of the assembly are then ready for reuse with a new cartridge 50.

During manufacture of the lyophilizate, a solution of substance to be lyophilized is placed in the cartridge 50 and is then frozen to a very low temperature, after which it is

heated suddenly under a very high vacuum, thereby causing the solvent, generally water, to sublime instantaneously. During this process, it is therefore important for the cartridge 50 and its tearable partition 2 to be good conductors of heat. The cartridge is preferably made of glass, which conducts heat better than plastic, and the tearable partition may be made of an aluminum complex. Since an aluminum complex is a better conductor of heat than glass, it is advantageous for the partition 2 to have as large an area as possible.

Making the cartridge out of glass and its tearable partition out of an aluminum complex also enhances conservation of the lyophilizate under conditions of dryness.

The cartridge 50 is provided with a plug 4 constituting a lid having a cylindrical skirt projecting therefrom to a bottom end. The skirt includes a slot 4a extending along a portion of its height from its bottom end. During the lyophilization process, the plug 4 is partially inserted so as to allow the chamber 1a to communicate with the outside via the slot 4a. At the end of lyophilization, the plug 4 is fully engaged while the cartridge is still in a vacuum, thereby closing the chamber 1a.

The embodiment shown in Figures 6 and 7 is designed to project powders, i.e. substances which are stored in powder form.

It differs from the preceding embodiment in that:

the cylindrical side wall 51 of the cartridge 50 includes a cylindrical housing extending downwards from the top end face to a horizontal annular surface 55, such that said housing delimits a cylindrical inside surface 57; and

said cylindrical housing receives a cylindrical cup 53 including a bottom and comprising a cylindrical peripheral surface which is smaller in diameter than the cylindrical inside surface 57, a substantially plane bottom surface provided with ribs 54 on its outside periphery, and a convex conical top surface 70. The ribs 54 rest on the horizontal annular surface 55 so as to leave a passage between the said cup 53 and the annular surface 55. The cup 53 also includes a cylindrical side wall extending upwards from said bottom and

including a cylindrical inside surface, a cylindrical outside surface, and a top end. The inside surface of the cylindrical side wall and the top surface of the bottom delimit a chamber 1A' containing the powder to be projected. The cylindrical side wall of the cup 53 has an outside diameter which is smaller than the diameter of the cylindrical inside surface 57. One or more non-radial orifices 58 pass through said cylindrical side wall of the cup 53 sloping downwards into the cup and opening out inside said cup close to the base of its convex conical surface 70. The top portion of the outside surface of the cylindrical side wall also includes a peripheral sealing lip 59 dimensioned and shaped to be a forcefit inside the surface 57 such that when compressed air penetrates into the cartridge 50 after the tearable partition 2 has been pierced, the cup 53 is not itself ejected. The cartridge 50 and the cup 53 are preferably also held in place by the endpiece 60.

Under these conditions, compressed air then passes between the ribs 54, to enter the annular space between the cup 53 and the inside surface 57, after which it penetrates into the chamber 1A' via the orifice(s) 58 whose disposition relative to the convex conical surface 70 gives rise to turbulence while simultaneously expelling the powder contained in the chamber 1A'.

Another embodiment is shown in Figure 8. In this embodiment, the chamber 1B is constituted by a cylinder 81 having a piston 5 sliding therein. The piston 5 is engaged in sealed manner on a rod 8 of a pushbutton 7, coming into abutment against a collar 8a on the rod. The rod 8 extends beyond the piston in the form of a pin 6 provided with grooves 84. The cylinder 81 has an end wall 82 with a hollow tube 83 passing therethrough and suitable for slidably receiving the pin 6. A spring 34 presses against the end wall 82 and against the piston 5 to urge the piston away from the end wall. Internal peripheral beading 9 is formed at a bottom end of the cylinder 81 so as to prevent the piston 5 from escaping from the cylinder. A top end of the tube 83 includes a housing suitable for receiving a cylindrical cartridge 50 as described

with reference to Figure 5, which cartridge is engaged in airtight manner therein. In addition, an endpiece 80 including the outlet orifice 3 is engaged over the cartridge 50. The width of the orifice 3 is preferably the same as that of the chamber 1A delimited by the cartridge 50. The endpiece 80 extends radially outwards in the form of a flange for facilitating grasping.

When the user presses against the pushbutton 7, the piston 5 compresses the air contained in the chamber 1B until the pin 6 pierces the tearable partition 2. The compressed air in the chamber 1B then escapes through the grooves 84 of the pin 6 and causes the lyophilizates contained in the chamber 1A to be projected out. At the end of its stroke, the piston 5 comes into abutment against one end of the tube 83 via ribs 85, which ensure that a free passage is left between the chamber 1A and the chamber 1B. When the user releases the pushbutton, the piston 5 returns to its initial position.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1/ A device for projecting a dose of divided substance, in liquid or powder form, and in particular for pharmaceutical use, the device comprising a receptacle having an outlet orifice, a tearable partition separating the receptacle into two chambers, namely a first chamber adjacent to the outlet orifice and designed to receive the divided substance, and a second chamber which, at the moment of use, contains a compressed gas, said second chamber of the receptacle including a wall which is deformable towards the tearable partition under drive from a pushbutton, the deformation of said wall having the effect of reducing the volume of said second chamber, thereby increasing the pressure therein, wherein the deformable wall is provided with a grooved pin so that deformation of the wall causes the pin to puncture the tearable partition, said pin being disposed so as to avoid perforating the partition until the pin has been displaced through a distance h, thereby causing the pressure inside said chamber to increase prior to the partition being perforated.

2/ A device according to claim 1, wherein the deformable wall is a flexible wall which is substantially hemispherical in shape, with one end of a drive rod of the pushbutton bearing thereagainst, and with the rim thereof being bonded to the body of the receptacle.

3/ A device according to claim 2, wherein the flexible wall is integrally molded with the pin and optionally also with the pushbutton and its rod.

4/ A device according to claim 1, wherein the deformable wall is a piston having one end of a rod of the pushbutton bearing thereagainst, the second chamber being a cylinder fitting the piston.

5/ A device according to claim 4, wherein said cylinder includes internal peripheral beading for retaining the piston.

6/ A device according to claim 1, wherein the pushbutton is integrally molded with a tear-off portion whose presence prevents the pushbutton being depressed.

7/ A device according to claim 1, wherein the receptacle is integrally molded with a tear-off portion whose presence prevents the pushbutton being depressed.

8/ A device according to claim 1, wherein the outlet orifice is provided with a liquid spray nozzle, the first chamber containing a first liquid, possibly together with a gas, the second chamber containing a gas, possibly together with a second liquid, with the contents of the first and second chambers mixing at the moment of utilization.

9/ A device according to claim 1, wherein the receptacle is formed as a single piece.

10/ A device according to claim 1, wherein the receptacle comprises:

a piston having an axial hole passing therethrough, a peripheral groove, and a peripheral sealing lip;

an endpiece including the outlet orifice and resilient means capable of snap-fastening in the groove of the piston, the endpiece and the piston defining a housing capable of receiving a cartridge, the cartridge comprising a side wall and the tearable partition, and representing the enclosure of said first chamber containing the substance to be projected, there being a contact surface between the piston and the cartridge, said contact surface providing an airtight seal; and

said device being further wherein the deformable wall is a hollow cylinder provided with an end wall and a cylindrical side wall inside which the piston slides so that the sealing lip is in contact with said side wall over its entire periphery, the grooved pin being disposed on the end wall of the cylinder in such a manner as to be capable of passing through the hole and piercing the tearable partition.

11/ A device according to claim 10, wherein a spring urges the cylinder away from the piston.

12/ A device according to claim 11, wherein its peripheral beading is formed on an inside surface of the cylinder so that when the device is assembled, the piston can be inserted inside the cylinder by forcing the sealing lip to pass over the beading, and wherein the urging from the spring plus the traction force required for undoing the snap-fastening of the resilient means of the endpiece is insufficient for moving the sealing lip back over the beading.

13/ A device according to claim 1, wherein a first end of a cartridge delimiting the first chamber is received in sealed manner as a push fit in one end of the second chamber, said first end of the cartridge being formed by the tearable partition, and wherein an endpiece including the outlet orifice is engaged as a push fit over a second end of the cartridge.

14/ A device according to claim 13, wherein the deformable wall is a piston having one end of a rod of the pushbutton bearing thereagainst, the second chamber being a cylinder fitting the piston, and wherein a spring urges the piston away from the cartridge.

15/ A device according to claim 1, wherein the tearable partition is a heat-sealed film.

16/ A device according to claim 1, wherein the tearable partition is made of a heat conducting material.

17/ A device according to claim 16, wherein the tearable partition occupies the entire cross-section of the first chamber so as to transmit a maximum amount of heat.

18/ A device according to claim 1, wherein the first chamber is filled with nitrogen in addition to the substance to be projected.

19/ A device according to claim 1, wherein the second chamber is filled with nitrogen at a pressure not less than atmospheric pressure.

20/ A device according to claim 1, wherein the first chamber includes a cylindrical cup containing a powder to be projected and constituted by an end wall and a peripheral side wall extending vertically from said end wall, said peripheral side wall including sealing means at its top end engaged as a force fit in said first chamber, said peripheral side wall also including at least one non-radial orifice passing therethrough directed inwards and towards the end wall of the cup, said end wall of the cup including a convex conical surface inside the cup, the cup co-operating with said first chamber so as to enable the compressed gas to pass from the inside of said first chamber into the cup via the orifice(s) without ejecting the cup, with the orifice(s) co-operating with said conical surface when the compressed gas passes therethrough to create turbulence while simultaneously expelling the substance to be projected.

21/ A device according to claim 1, wherein the receptacle is made of glass.

22/ A device according to claim 1, wherein the receptacle is made of plastic.

23/ A device according to claim 2, wherein the cartridge is made of glass.

24/ A device according to claim 13, wherein the cartridge is made of glass.

25/ A device according to claim 10, wherein the cartridge is made of plastic.

26/ A device according to claim 13, wherein the cartridge is made of plastic.

27/ A device according to claim 1, wherein the first chamber is uniform in cross-section.

28/ A device according to claim 27, wherein the outlet orifice has the same section as the first chamber.

29/ A device according to claim 1, provided with a plug including a lid with a skirt projecting therefrom to a bottom end of the skirt, said skirt engaging as a sealed force fit in the first chamber, the device being wherein the skirt includes a slot extending up a portion of its height from its bottom end.

30/ A device according to claim 1, provided with a plug for closing the first chamber, wherein a tear-off metal capsule is crimped over the plug.

FIG .1

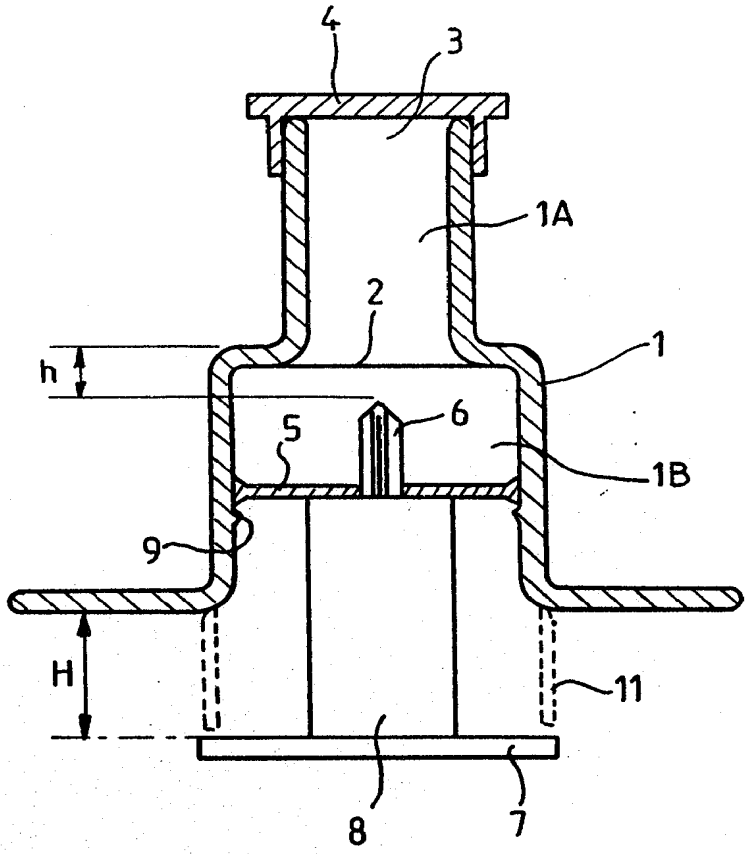

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FIG.2

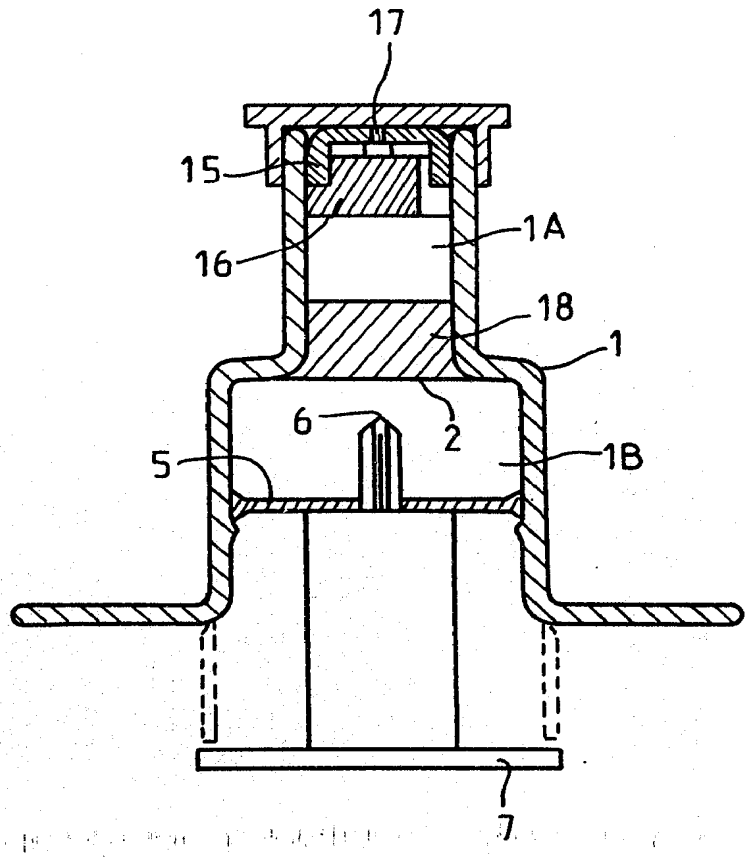

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FIG.3

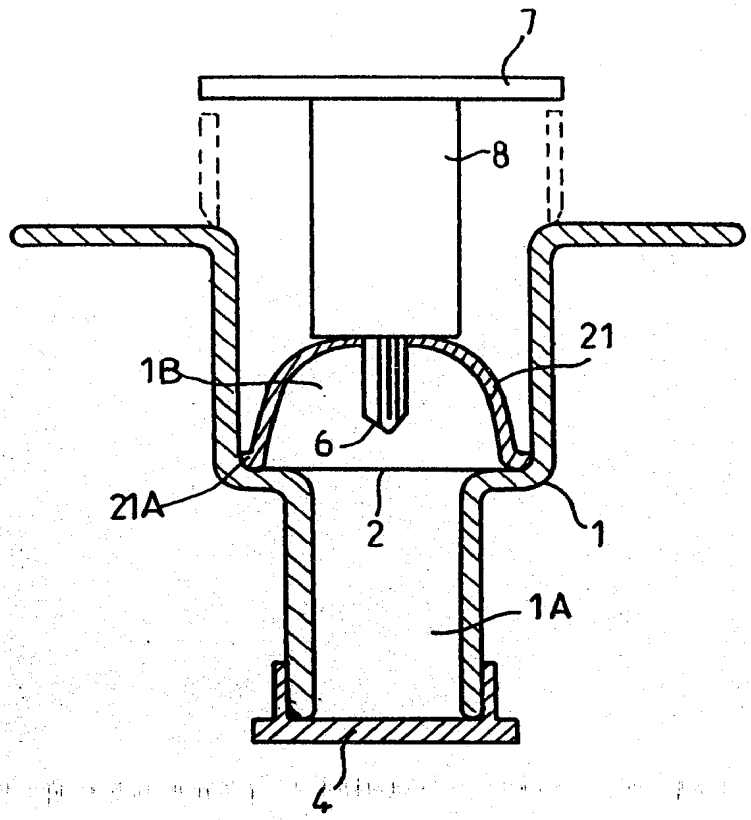

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FIG.4

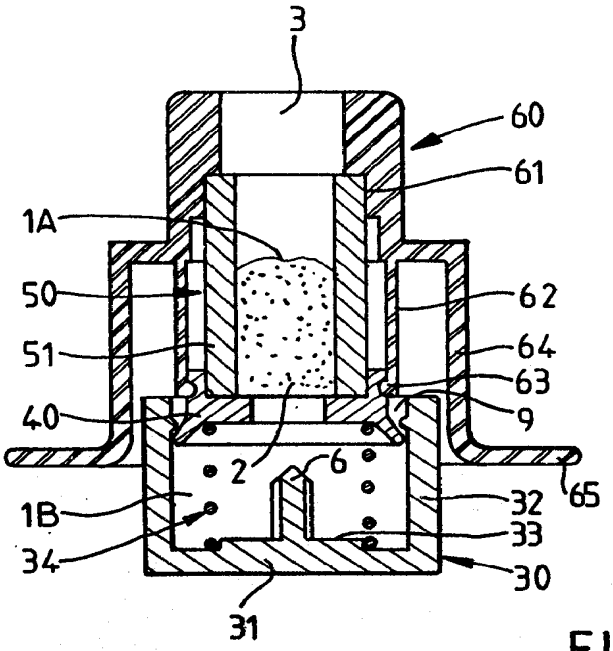

FIG.6

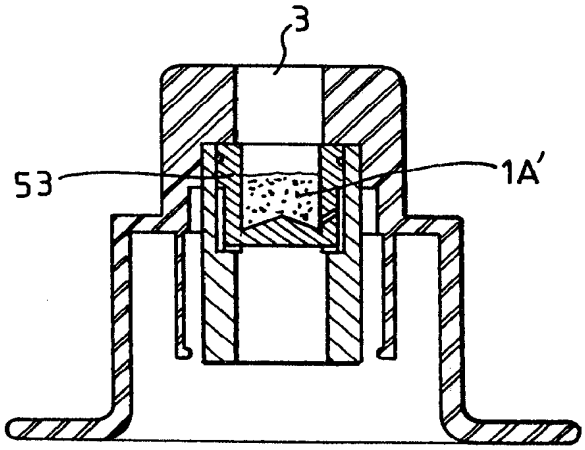

FIG.4a

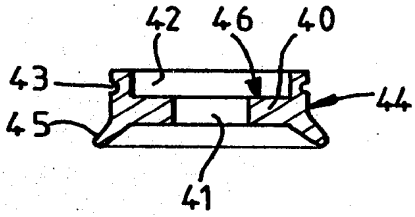

FIG.5

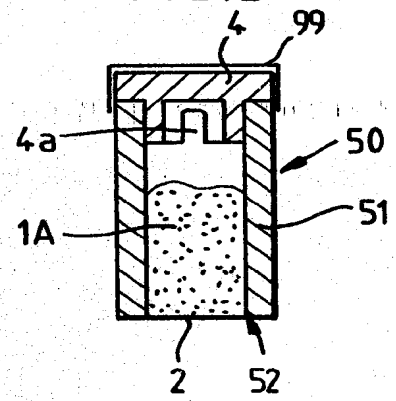

FIG.7

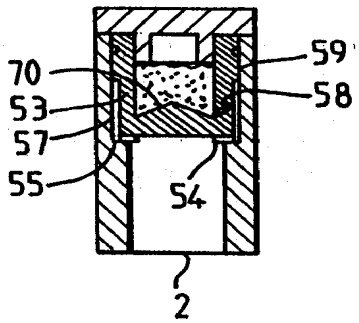

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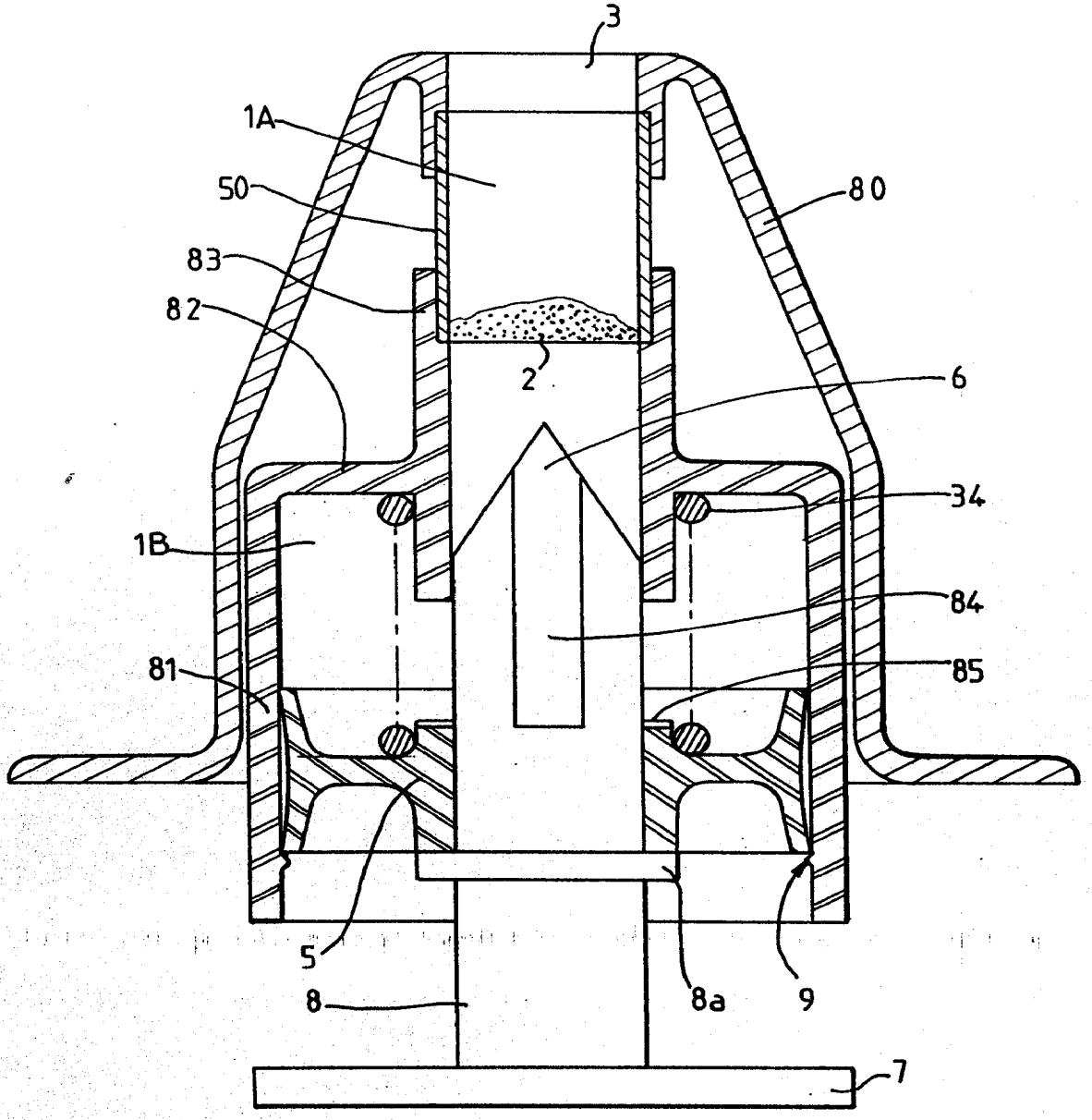
FIG.8



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